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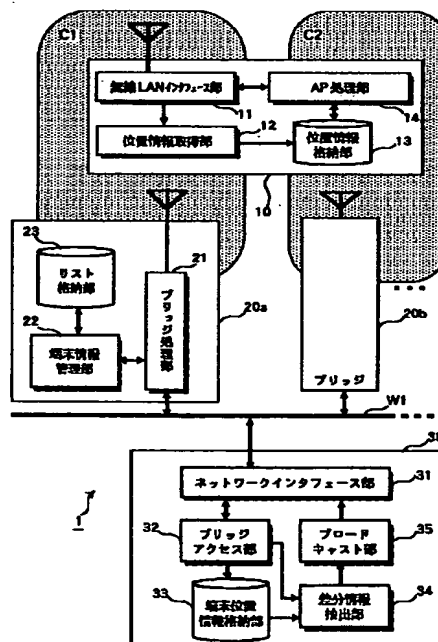
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(54) 【発明の名称】 無線LANシステム

(57) 【要約】

【課題】 無線端末が、自己及びシステム全体の処理量の増大を抑えながら、容易に自己の位置を特定できるようにした無線LANシステムを提供する。

【解決手段】 予め配設位置が定められ、有線ネットワークW1を介して接続された複数のブリッジ（無線基地局）20a、20b、…と、通信可能なブリッジとの間で無線通信を行う無線端末10と、無線端末10の相対位置を有線ネットワークW1を通じて各ブリッジから取得し、取得したすべての無線端末10の相対位置を各ブリッジに通知する端末位置情報管理サーバ30とを含んで無線LANシステム1を構築する。ブリッジ20a、20b、…は、端末位置情報管理サーバ10から通知された相対位置をすべての無線端末10宛に同報し、無線端末10は、受信した相対位置に基づいて自己の現在位置を特定する。



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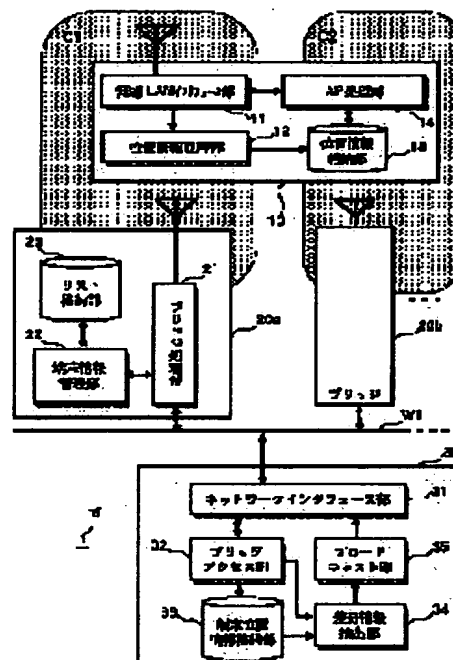
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(54) RADIO LAN SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a radio LAN system by which a radio terminal can easily obtain its own position without increasing the processing amount of its own and the entire system.

SOLUTION: A radio LAN system 1 is built by including a radio terminal 10 that makes radio communication between communicable bridges; a plurality of bridges (radio base stations) with predetermined positioning 20a, 20b,... connected via a wire network W1; and a terminal position information management server 30 that acquires a relative position of the radio terminal 10 from each bridge through the wired network W1 and informs each bridge of the acquired relative position of all the radio terminals 10. The bridges 20a, 20b... provide multiaddress information of the relative positions received from the terminal position information management server 30 to all the radio terminals 10 and the radio terminals 10 specify its own current position based on the received relative positions.



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CLAIMS

[Claim(s)]

[Claim 1] The wireless LAN system characterized by providing the following. Two or more base transceiver stations which the arrangement position was defined beforehand and connected through the cable network, respectively. The end of the non-end of line radio is performed among the base transceiver stations which can communicate. Terminal positional information management equipment which notifies each base transceiver station of all the relative positions in the end of the non-end of line that acquired the relative position in the end of the non-end of line which can communicate, respectively from each base transceiver station, and acquired it through the aforementioned cable network. A means by which ***** and two or more aforementioned base transceiver stations have the means which carries out the multiple address of the aforementioned relative position notified from the aforementioned terminal positional information management equipment, respectively to ** in all the aforementioned end of the non-end of line, and the aforementioned radio terminal pinpoints the self current position based on the aforementioned relative position which received.

[Claim 2] The wireless LAN system characterized by providing the following. Two or more base transceiver stations which the arrangement position was defined beforehand and connected through the cable network, respectively. The end of the non-end of line radio is performed among the base transceiver stations which can communicate. Whenever it detects the aforementioned radio terminal with which the surveillance intelligence showing the existence of the aforementioned radio terminal with which the base transceiver station which becomes a communications partner was changed was acquired from each base transceiver station through the aforementioned network, and the base transceiver station was changed based on the surveillance intelligence which carried out [aforementioned] acquisition, they are the radio terminal concerned and terminal positional information management equipment which notifies each base transceiver station of the identification information of the base transceiver station after change at least. A means by which ***** and two or more aforementioned base transceiver stations have the means which carries out the multiple address of the aforementioned identification information notified from the aforementioned terminal positional information management equipment, respectively to ** in all the aforementioned end of the non-end of line, and the aforementioned radio terminal pinpoints the self current position based on the aforementioned identification information which received.

[Claim 3] The aforementioned terminal positional information management equipment is a wireless LAN system according to claim 1 or 2 characterized by performing the information acquisition from each base transceiver station all at once, and performing the aforementioned notice by broadcasting.

[Claim 4] the time of the aforementioned terminal positional information management equipment performing all at once and periodically the information acquisition from each base transceiver station, and having difference with the acquisition information on the last -- the information on the difference concerned -- broadcasting -- continuous -- repeating -- each base transceiver station -- notifying -- the above -- the wireless-LAN system according to claim 1 or 2 characterized by to repeat acquisition information at intervals of predetermined, and to notify

each base transceiver station of it by broadcasting when there is no difference

[Claim 5] The claim 1 characterized by classifying two or more aforementioned base transceiver stations into two or more groups, and the aforementioned terminal positional information management equipment existing for every group, or a wireless LAN system given [of 4 / one] in a term.

[Claim 6] Terminal positional information management equipment characterized by being constituted so that it may have the following and the self current position may be made to pinpoint to each radio terminal through the identification information which carried out [aforementioned] broadcasting, and its positional information. Two or more base transceiver stations which the arrangement position was defined beforehand and connected through the cable network, respectively. 1st means to be equipment connected to the aforementioned cable network in the wireless LAN system constituted including the end of the non-end of line radio is performed among the base transceiver stations which can communicate, and to acquire the identification information in the end of the non-end of line it can communicate, respectively, and its positional information from each base transceiver station through the aforementioned cable network. 2nd means to broadcast to ** the identification information of all the aforementioned radio terminals that carried out [aforementioned] acquisition, and its positional information in all the aforementioned end of the non-end of line.

[Claim 7] Terminal positional information management equipment characterized by being constituted so that it may have the following and the self current position may be made to pinpoint to each radio terminal through the identification information which carried out [aforementioned] broadcasting. Two or more base transceiver stations which the arrangement position was defined beforehand and connected through the cable network, respectively. 3rd means to acquire the surveillance intelligence showing the existence of the aforementioned radio terminal with which it is equipment connected to the aforementioned cable network in the wireless LAN system constituted including the end of the non-end of line radio is performed among the base transceiver stations which can communicate, and the base transceiver station which becomes a communications partner was changed from each base transceiver station through the aforementioned network. Whenever it detects the end of the non-end of line the base transceiver station was changed based on the surveillance intelligence which carried out [aforementioned] acquisition, they are the radio terminal concerned and 4th means to broadcast the identification information of the aforementioned base transceiver station after change to ** at least in all the aforementioned end of the non-end of line.

[Claim 8] Terminal positional information management equipment according to claim 6 or 7 characterized by repeating the aforementioned broadcasting two or more times from the same content.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] the wireless LAN system by which the end of the non-end of line enabled it to detect the self current position when the carried type terminal (the end of the non-[the following and] end of line) which this invention required for the network technology adapting mobile-computing technology, and was especially equipped with the radio function moved freely in the inside of predetermined area -- it reaches and is related with the component

[0002]

[Description of the Prior Art] The wireless LAN system which performs information communication between the computer apparatus connected to comrades, or the end of the non-end of line and a cable network by making an electric wave into a transmission medium in the end of the non-end of line is put in practical use. in Japan, the wireless LAN system by which transmission speed has the performance whose range with several bps - about tenMbps(es), and the end of the non-end of line is dozens of m is put in practical use as a transmission frequency using the band (2.4GHz or 19GHz) about the basic technology of this wireless LAN system, "a mobile communications handbook [Sato and Tachikawa coeditorship: and Ohm-Sha Ltd. (1995)]", "wireless-data-transmission admission description" [a wireless-data-transmission study group:soft research center (1994)], etc. are boiled, and it is introduced in detail

[0003] Drawing 6 is drawing having shown the general example of composition of a wireless LAN system. This wireless LAN system 60 is constituted including two or more bridges (base transceiver station) 62, 63, and 64 which perform the interconnection between 61 and the cable network W1 in 61 and the end of the non-end of line in the end of the non-end of line. Bridges 62-64 are arranged in the position geographically distant, respectively, and can perform radio now over a wide area in the end of the non-end of line it moves in the area covered by cells C1, C2, and C3 between 61.

[0004] When 61 moves to other cells from one cell in the end of the non-end of line, the processing which changes the bridge used as a communications partner is needed. This processing is called roaming (or hand over). As a wireless LAN system with the function of this roaming, there is "Wave LAN" etc. by NCR Japan, for example [Wave LAN WavePOINT manual:NCR Japan and Local Area Networks, BYTE, and June 1995 references (Baldazo etc.)]. In such a wireless LAN system, each bridge holds the list of identifiers in the end of the non-end of line which are performing the present communication, i.e., a terminal management list. The hardware addresses (Media Access Control Address in Ethernet etc.) which the network interface for example, in the end of the non-end of line has are used for an identifier.

[0005] For example, in drawing 6 , it considers that 61 moves to a cell C2 from a cell C1 in the end of the non-end of line. While existing in a cell C1, 61 is radiocommunicating with the bridge 62 and the identifier of 61 is described by the terminal management list of bridges 62 in the end of the non-end of line in the end of the non-end of line. If 61 moves to a cell C2 from a cell C1 in this state in the end of the non-end of line, since communication with a cell C1 will become difficult, 61 changes a communications partner into a bridge 63 from a bridge 62 to a certain

timing in the end of the non-end of line. Consequently, the identifier of 61 is deleted from the terminal management list of bridges 62, and, on the other hand, is newly registered into the terminal management list of bridges 63 in the end of the non-end of line. Since this roaming function is performed by the wireless LAN driver on 61, and the software on each bridge in the end of the non-end of line, the user of 61 does not need to recognize that any roaming is performed in the application program in a system, or the end of the non-end of line.

[0006]

[Problem(s) to be Solved by the Invention] By the way, there is information offer service which offers the information according to the current position in the end of the non-end of line as a use form of the wireless LAN system in the environment which a user moves with the end of the non-end of line. For example, the visitor (user) is made to possess the end of the non-end of line in a museum or an art gallery, a bridge is arranged to every place inside a hall, and the end of the non-end of line enables it to access a network inside a hall. And when a visitor drops in at each exhibition, it enables it to offer required information appropriately according to a position by acquiring the information about the exhibition object from a network, and showing a visitor.

[0007] When realizing such information offer service, the application program on the end of the non-end of line always needs to recognize the positional information in which position self is now. In a bridge side, since the terminal management list about the end of the non-end of line it exists in a cell is possessed, if it can check that the end of the non-end of line exists in a self cell, required information is acquired via a cable network and this can be offered in the end of the non-[concerned] end of line.

[0008] However, in order for the end of the non-end of line to know the self current position, it accesses in order to all bridges, and it looks for a terminal management list and the processing which investigates whether the self identifier is registered is needed. Moreover, since this processing must be repeated a fixed period at least and positional information must be maintained the end of the non-end of line, the problem of becoming very large also has the throughput which should be performed in the end of the non-end of line. In view of the whole system, the amount of information which flows on a network will increase very much.

[0009] Then, the technical problem of this invention is to offer the wireless LAN system by which it was improved for acquiring efficiently the positional information in the end of the non-end of line, and its component.

[0010]

[Means for Solving the Problem] The wireless LAN system of this invention which solves the above-mentioned technical problem The terminal positional information management equipment which acquires from each base transceiver station and notifies each base transceiver station of all the acquired relative-position information in the end of the non-end of line, ***** and two or more aforementioned base transceiver stations have the means which carries out the multiple address of the aforementioned relative-position information notified from the aforementioned terminal positional information management equipment, respectively to ** in all the aforementioned end of the non-end of line. The aforementioned radio terminal is characterized by having a means to pinpoint the self current position based on the received aforementioned relative-position information.

[0011] The base transceiver station and the end of the non-end of line of the aforementioned plurality [systems / wireless LAN / of this invention / other], The surveillance intelligence showing the existence of the aforementioned radio terminal with which the base transceiver station which becomes a communications partner was changed is acquired from each base transceiver station through the aforementioned network. Whenever it detects the aforementioned radio terminal with which the base transceiver station was changed based on the surveillance intelligence which carried out [aforementioned] acquisition, the radio terminal concerned and the terminal positional information management equipment which notifies each base transceiver station of the identification information of the base transceiver station after change at least, It is characterized by for ***** and two or more aforementioned base transceiver stations having the means which carries out the multiple address of the aforementioned identification information notified from the aforementioned terminal positional

information management equipment, respectively to ** in all the aforementioned end of the non-end of line, and having a means by which the aforementioned radio terminal pinpoints the self current position based on the aforementioned identification information which received.

[0012] The aforementioned terminal positional information management equipments perform the information acquisition from each base transceiver station all at once, and perform the aforementioned notice by broadcasting. or the time of performing all at once and periodically the information acquisition from each base transceiver station, and there being difference with the acquisition information on the last — the information on the difference concerned —

broadcasting — continuous — repeating — each base transceiver station — notifying — the above — when there is no difference, by broadcasting, acquisition information is repeated at intervals of predetermined, and each base transceiver station is notified of it

[0013] Two or more aforementioned base transceiver stations are classified into two or more groups, and you may make it the aforementioned terminal positional information management equipment exist for every group.

[0014] this invention offers the above-mentioned wireless LAN structure-of-a-system equipment, i.e., terminal positional information management equipment. With two or more base transceiver stations by which the arrangement position was defined and, as for this terminal positional information management equipment, was beforehand connected through the cable network, respectively It is equipment connected to the aforementioned cable network in the wireless LAN system constituted including the end of the non-end of line radio is performed among the base transceiver stations which can communicate. 1st means to acquire the identification information in the end of the non-end of line it can communicate, respectively, and its positional information from each base transceiver station through the aforementioned cable network, It has 2nd means to broadcast to ** the identification information of all the aforementioned radio terminals that carried out [aforementioned] acquisition, and its positional information in all the aforementioned end of the non-end of line. It is characterized by being constituted so that the self current position may be made to pinpoint to each radio terminal through the identification information which carried out [aforementioned] broadcasting, and its positional information.

[0015] 3rd means to acquire the surveillance intelligence showing the existence of the aforementioned radio terminal with which the base transceiver station where other terminal positional information management equipments of this invention serve as a communications partner was changed from each base transceiver station through the aforementioned network, Whenever it detects the end of the non-end of line the base transceiver station was changed based on the surveillance intelligence which carried out [aforementioned] acquisition, it has a radio terminal and 4th means to broadcast the identification information of the aforementioned base transceiver station after change to ** at least in all the aforementioned end of the non-end of line concerned. It is characterized by being constituted so that the self current position may be made to pinpoint to each radio terminal through the identification information which carried out [aforementioned] broadcasting.

[0016]

[Embodiments of the Invention] Hereafter, with reference to a drawing, the form of operation of this invention is explained in detail. Drawing 1 is a wireless LAN structure-of-a-system view concerning 1 operation form of this invention. This wireless LAN system 1 is constituted in the end of the non-end of line it consists in two or more bridges (base transceiver station) 20a and 20b, ... and one terminal positional information management server 30 which were connected to the cable network W1, each bridges 20a and 20b and the cells C1 and C2 of ..., and ... including 10. Wireless LAN is formed by ten comrades in 10 or the end of the non-end of line in the end of the non-[each bridges 20a and 20b, ...,] end of line.

[0017] In the end of the non-end of line 10 While offering the interface of Bridges 20a and 20b and the radio performed between ... The situation of the radio in self The positional information acquisition section 12 which acquires the below-mentioned terminal positional information from the receipt information which received through the wireless LAN interface section 11 and the wireless LAN interface section 11 which are monitored continuously, the positional information

storing section 13 stored free [updating of the acquired terminal positional information], It has AP (application) processing section 14 which performs various processings based on the terminal positional information stored.

[0018] These functional block is formed when computer apparatus, for example, notebook, type a personal computer or a PDA (Personal Digital Assistant) terminal reads and performs a predetermined program. 10 can move freely two or more cells C1 and C2 and ... in this end of the non-end of line, communicating by comrades between the computer apparatus connected to the cable network W1 through Bridges 20a and 20b and ..., or in the end of the non-end of line.

[0019] In addition, in the cable network W1, the broadcasting function which broadcasts the information on the same contents by one transmission in addressing in all the end of the non-end of line each bridge can communicate is supported through Bridges 20a and 20b and ... That is, when the cable network W1 uses IP protocol on Ethernet, IP broadcasting function specified by IP protocol can be used. This broadcasting function itself is well-known.

[0020] It is created by the terminal Research and Data Processing Department 22 and the terminal Research and Data Processing Department 22 which perform required terminal-management processing when realizing the bridge processing section 21 which performs communications control processing between the terminal positional-information management servers 30 connected to bridge 20a through 10 or the cable network W1 in the end of the non-end of line it exists in a self cell, and the above-mentioned roaming, and the list storing section 23 which stored the terminal-management list referred to at any time is had. In the bridge processing section 21, it also has the function which carries out multiple address transmission of the information from the terminal positional information management server 30 to all the end of the non-end of line it can communicate.

[0021] A terminal management list list-izes management information of the identification information and others of 10 in the end of the non-end of line it can communicate. That is, when 10 enters in a self cell in the end of the non-end of line, the information about 10 is recorded in the end of the non-end of line, and on the other hand, when 10 moves to the cell of other bridges in the end of the non-end of line, all the recording information about 10 is deleted in the end concerned of the non-end of line. Therefore, it can use as surveillance intelligence which expresses with the terminal positional information management server 30 side the existence in the end of the non-end of line by which the bridge used as a communications partner was changed in this terminal management list.

[0022] These functional block is formed when the computer apparatus which realizes a bridge reads and performs a predetermined program. Other bridge 20b and ... are constituted similarly.

[0023] In the terminal positional information management server 30 Bridges 20a and 20b and ... are periodically accessed through the network interface section 31 which offers the interface of the wire communication between the cable networks W1, and this network interface section 31. The bridge access section 32 which reads the terminal management list which each bridge holds, and all the read terminal management lists are unified. The terminal positional information storing section 33 which stores the terminal positional information to which each radio terminal 10 means in which cell it is located now free [updating] in a radio terminal unit, and the newly obtained terminal positional information are compared with the terminal positional information held now. While judging whether there is any end of the non-end of line the position of a cell is changed, when there is the end of the non-end of line the cell position is changed The broadcasting function of a network is used for information. the difference which extracts the change information (difference information) about the end of the non-end of line -- the information in the information extraction section 34 and the terminal positional information storing section 33, or difference -- It has all the broadcasting sections 35 that address in the end of the non-end of line, and perform multiple address broadcast alternatively. The above-mentioned functional block 31-35 is also formed when the computer apparatus which has a server function reads and performs a predetermined program.

[0024] the information from which the broadcasting section 35 serves as a candidate for transmitting -- difference -- the period of broadcasting and the number of times of a repeat of the information on the same content can be changed now by information or the terminal

positional information by which after progress is not updated during a fixed period for example, difference — although 1 time of data size becomes small in the case of information, since it is possible that 10 fails to receive in the end of the non-end of line, multiple-times repeat broadcasting of this is carried out continuously. On the other hand, in the case of the terminal positional information which is not updated, it broadcasts repeatedly about 2 to 3 times intermittently.

[0025] Terminal positional information consists of groups of the terminal identification child (hardware address) for discriminating 10 uniquely in the end of the non-end of line, and the cell identifier for discriminating uniquely the cell of the bridge where 10 exists in the end of the non-end of line, as shown in drawing 2. A cell and a bridge are that are matched beforehand, and a bridge decodes this terminal positional information since the installation position is defined beforehand, and the current position of 10 can be pinpointed now in the end concerned of the non-end of line. That is, this terminal positional information turns into information which expresses the relative position of 10 in the end of the non-end of line. In addition, since terminal positional information should just pinpoint and obtain the position of 10 in the end of the non-end of line, it can be replaced with the above-mentioned cell identifier, and the identification information of the bridge after change can also be especially used for it before and after cell change.

[0026] In the wireless LAN system 1 constituted as mentioned above, a procedure until 10 actually pinpoints the self current position in the end of the non-end of line is explained using drawing 3 - drawing 5. Drawing 3 shows Bridges 20a and 20b and the procedure in ... Although the contents of the radio to which Bridges 20a and 20b and ... are usually carried out between 10 in the cable network W1 and the end of the non-end of line are relayed. If it detects 10 having separated from the cell range of self in the end of the non-end of line, or having moved to self cell within the limits from other cells in the bridge processing section 21. It is recognized as the bridge which 10 moves in the end of the non-end of line, and serves as a communications partner having been changed (Step S101), and the contents of the terminal management list of [in the list storing section 23] are updated (Step S102).

[0027] Since a connection request is published from 10 on a bridge in the end concerned of the non-end of line when [of 10] it has newly moved to cell within the limits, movement is detectable with this in the end of the non-end of line. Although 10 publishes a connection request to the bridge of a movement place similarly in the end of the non-end of line when 10 separates from the cell range on the other hand in the end of the non-end of line and it moves to the cell of other bridges, since the bridge notifies connection of 10 to other bridges via the cable network W1 this time in the end of the non-[new] end of line, it is detectable with this.

[0028] Drawing 4 shows the procedure in the terminal positional information management server 30. In the terminal positional information management server 30, the bridge access section 32 accesses all the bridges 20a and 20b connected to the cable network W1, and ..., and reads the terminal management list with which it is held on each bridge (Step S201). At this time, it is desirable to access two or more bridges simultaneously and to read a terminal management list in parallel. If it does in this way, read-out processing of a terminal management list is more accelerable. Access to each bridge is realizable by following SNMP (Simple Network Management Protocol, RFC1157.).

[0029] if a terminal management list is read from all bridges (Step S202) — next, difference — the case where the information extraction section 34 compares the terminal positional information acquired this time with the terminal positional information already held at the terminal positional information storing section 33, and there is change — difference — information is created (Step S203). Moreover, the contents of the terminal positional information storing section 33 are updated by the contents of the terminal positional information acquired this time (Step S204). then, the broadcasting section 35 — difference — information or the information in the terminal positional information storing section 33 is broadcast to addressing in all the end of the non-end of line (Step S205).

[0030] Drawing 5 shows the procedure in 10 in the end of the non-end of line. —less — end of the end of line 10 — the wireless LAN interface section 11 — a radio situation — always —

supervising — difference — it waits to broadcast information or terminal positional information from Bridges 20a and 20b and ... (Step S301: No) difference — when information etc. is received, (Step S301: Yes) and this are notified to the positional information acquisition section 12 the difference with which analyzed receipt information and the terminal identification child of self was described to be in the positional information acquisition section 12 — it checks whether there is any information etc. If there is information the terminal identification child of self was described to be (Step S302: Yes), the identification information of the cell identifier of them or the bridge before and behind change will be taken out, and terminal positional information will be updated (Step S303). Thereby, in AP processing section 14, it can specify now easily in which cell self exists now. After a position is pinpointed, the service information according to the position can be acquired through a network by telling the position concerned to Bridges 20a and 20b and the information server connected to the network through ...

[0031] thus, in the wireless LAN system 1 of this operation form The terminal positional information management server 30 accesses Bridges 20a and 20b and ..., and acquires the terminal positional information about 10 in all the end of the non-end of line it can communicate. Since the acquired terminal positional information was broadcast to each addressing to a radio terminal Like a conventional-type system, it becomes unnecessary for the end of the non-end of line and a bridge to detect a terminal position individually, respectively, and increase of the throughput in each and the amount of data on wireless LAN or the cable network W1 is suppressed.

[0032] Moreover, compared with the case where it notifies to 1 to 1 to each end of the non-end of line since the simultaneous notice of the terminal positional information is given by the broadcasting function which a network supports at each addressing to a radio terminal, terminal positional information can be transmitted more now to high speed.

[0033] In addition, although this operation form showed the example at the time of forming one terminal positional information management server 30 to two or more bridges 20a and 20b and ..., Bridges 20a and 20b and ... are divided into some groups, the terminal positional information management server of the above-mentioned composition is prepared to each group, respectively, and you may make it make server processing decentralize. If it does in this way, processing of each terminal positional information management server is mitigated, and terminal positional information can be more quickly acquired by 10 sides in the end of the non-end of line.

[0034] Moreover, in 10, it can also constitute in the end of the non-end of line so that not only the terminal positional information of self but other terminal positional information may be held. If it does in this way, information service of communicating and suiting by comrades in the end of the non-end of line it is, for example in point-blank range will become realizable.

[0035]

[Effect of the Invention] Since the terminal positional information about all the end of the non-end of line is notified to each radio terminal through a base transceiver station from terminal positional information management equipment according to this invention so that clearly from the above explanation, it is effective in the throughput on each end of the non-end of line or a base transceiver station and the amount of data on wireless LAN or a cable network being reduced from the thing of the conventional technology.

[0036] Moreover, since the repeat notice of the terminal positional information is given all at once by broadcasting to each addressing to a radio terminal, information can be transmitted at high speed and certainly. Furthermore, in case terminal positional information is notified to each addressing to a radio terminal, the amount of data of one notice can be reduced more by notifying only the information about the end of the non-end of line it was changeable as compared with last time.

[Translation done.]

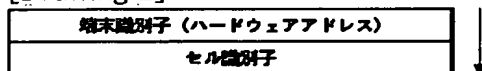
* NOTICES *

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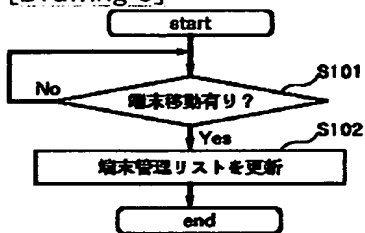
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

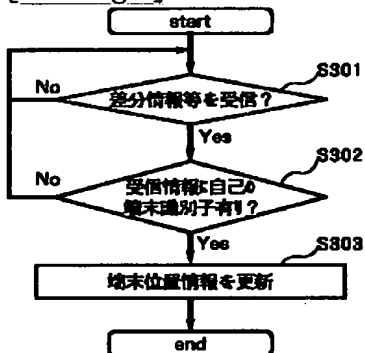
[Drawing 2]



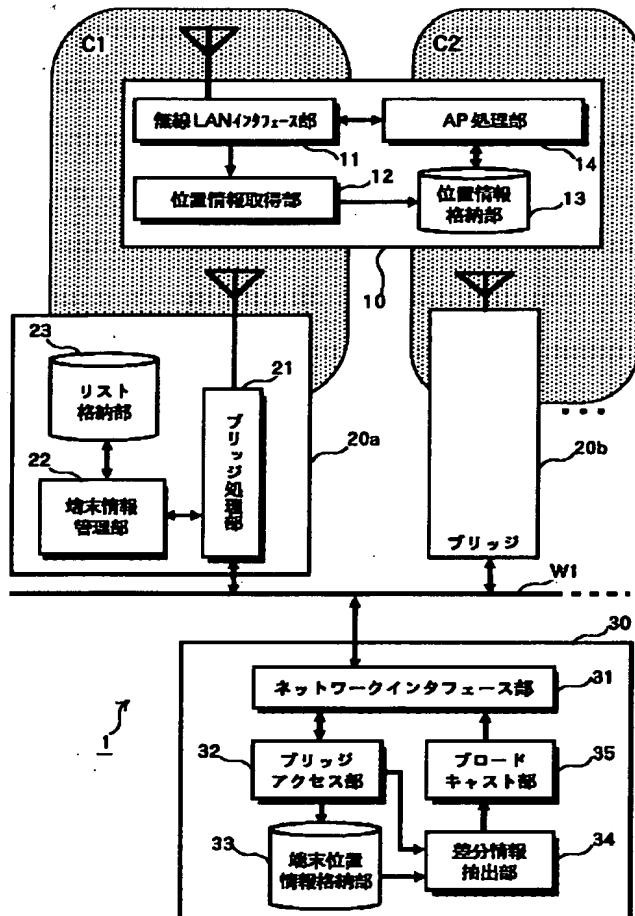
[Drawing 3]



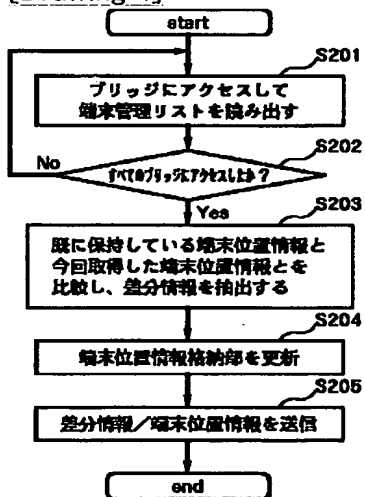
[Drawing 5]



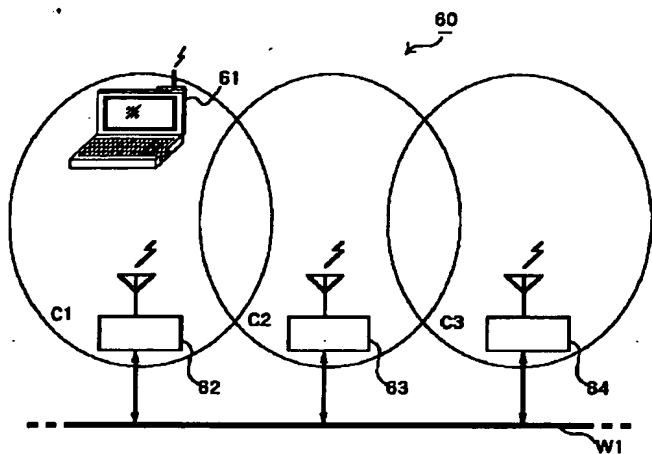
[Drawing 1]



[Drawing 4]



[Drawing 6]



[Translation done.]